BASELINE VEGETATION AND WILDLIFE REPORT
FOR ALTERNATE DAM SITES
ON THE LOWER KOOTENAI RIVER
KOOTENAI RIVER HYDROELECTRIC PROJECT

by

Pat Nichols
Wildlife Biologist
Facility Siting Division
Department of Natural Resources and Conservation

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for
NORTHERN LIGHTS INC.
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ACKNOWLEDGMENTS

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INTRODUCTION

This is a baseline report on the vegetation and wildlife concerns of the Kootenai River dam sites designated by the applicant, Northern Lights, Inc., (NLI) as alternatives to the proposed Kootenai Falls site. NLI funded the report in compliance with the Montana Major Facility Siting Act.

Objectives

The objectives of this study were (1) to characterize the existing vegetation and wildlife resources of alternative sites, and (2) to provide supplemental information on bighorn sheep habitat, movements, and habitat use in the Sheppard meadows area.

PART I. DESCRIPTION AND COMPARISON OF ALTERNATIVE SITES

The study area, comprising four alternative dam sites covering approximately 27 river miles, begins on the Kootenai River at the Katka Dam site, located in Idaho approximately 4.5 miles upstream from the confluence of the Moyie and the Kootenai rivers. The Rocky Creek-Tunnel No. 8 Dam site is located approximately 8.5 miles upstream from the Katka site. The Ruby Creek Dam site is located approximately 7.5 miles upstream of the Rocky Creek-Tunnel No. 8 site; and the O'Brien Creek site is located approximately 5.5 miles upstream of the Ruby Creek site. The study area ends approximately one-half mile downstream of Kootenai Falls (see Figure 1 for alternate dam site locations).

Some of the sites included in HARZA's (1980) report, Northern Lights, Inc., Kootenai River Hydroelectric Project: Alternative Power Sites on the Kootenai River, were not described in the application and are not specifically included

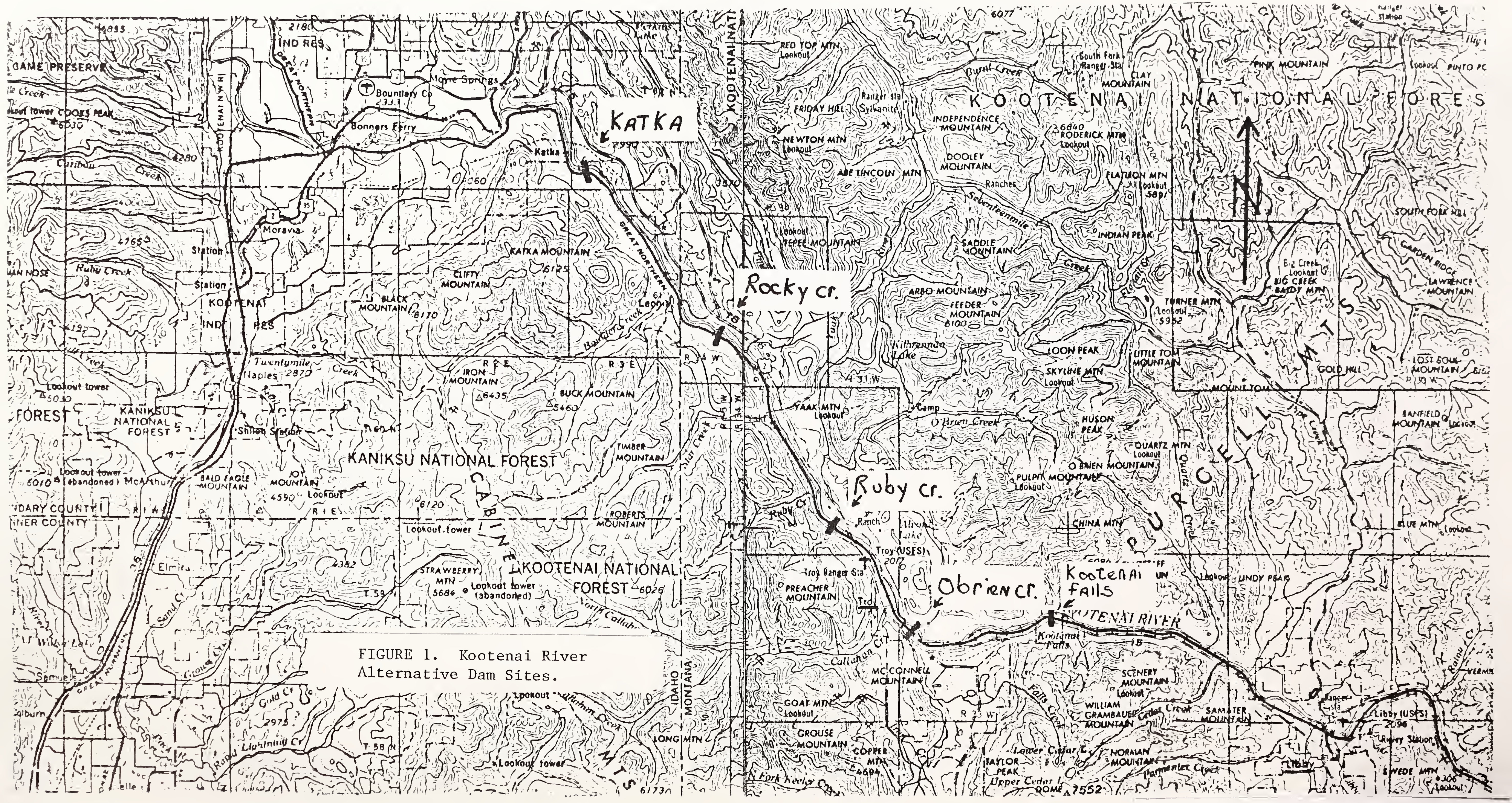
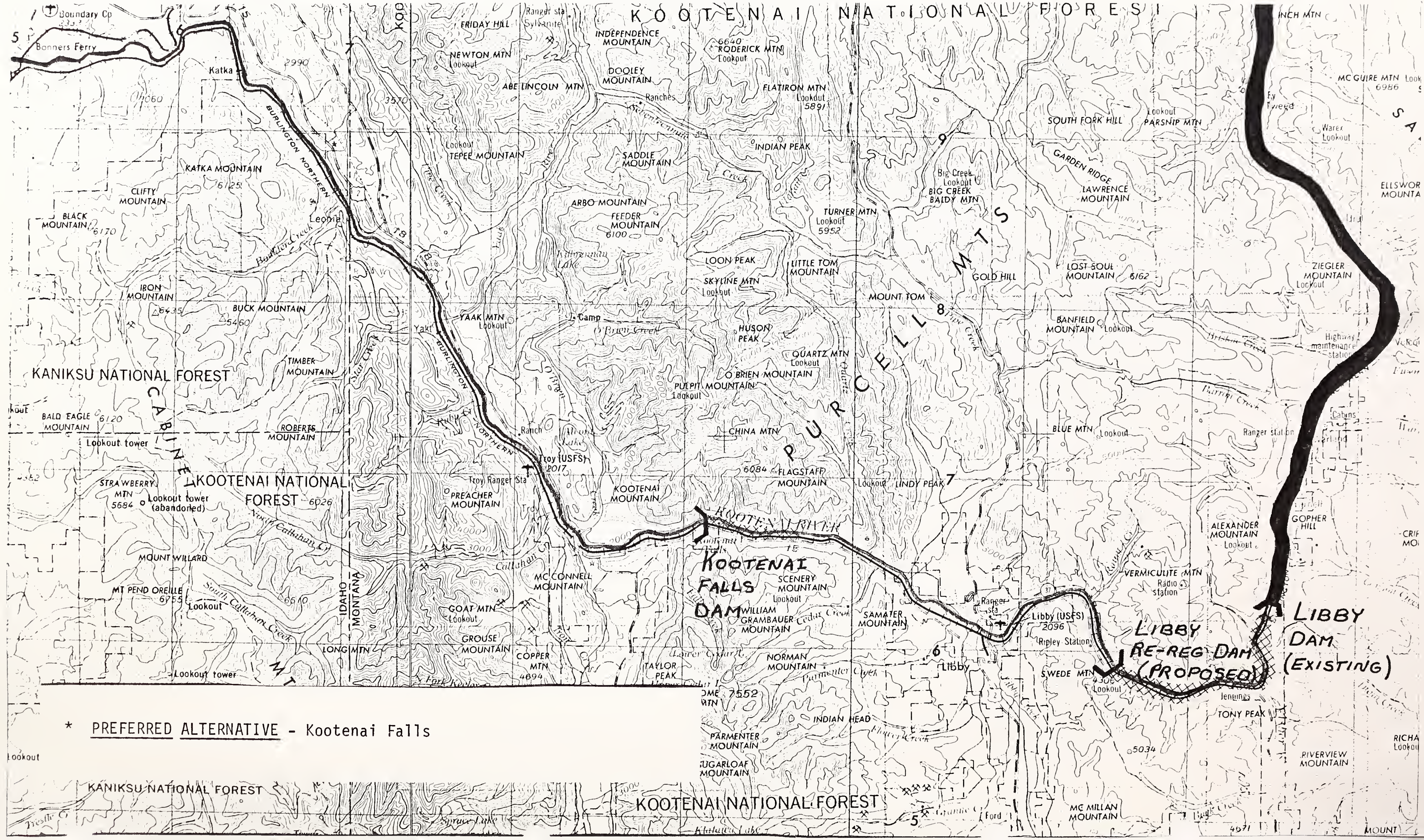
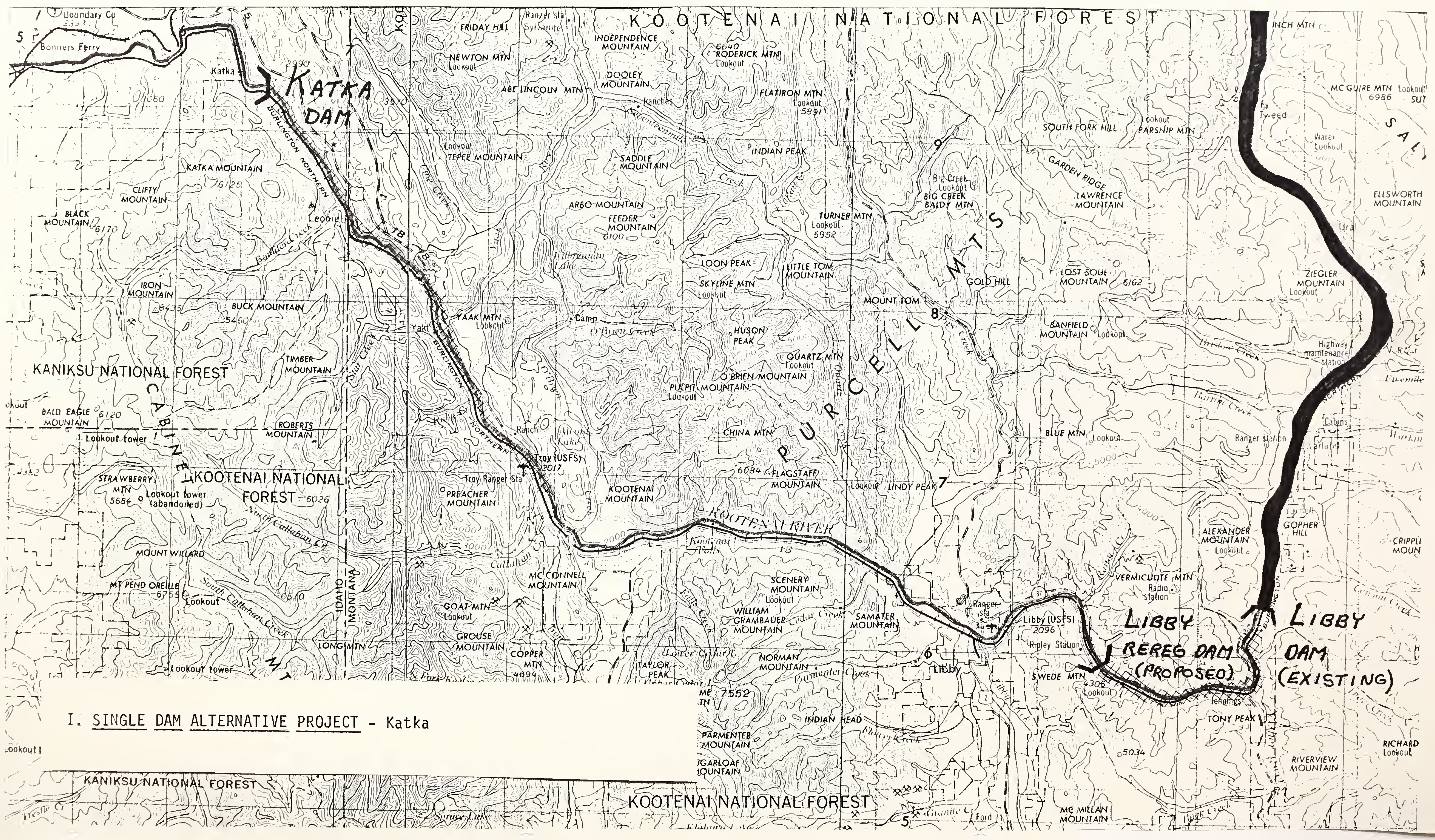


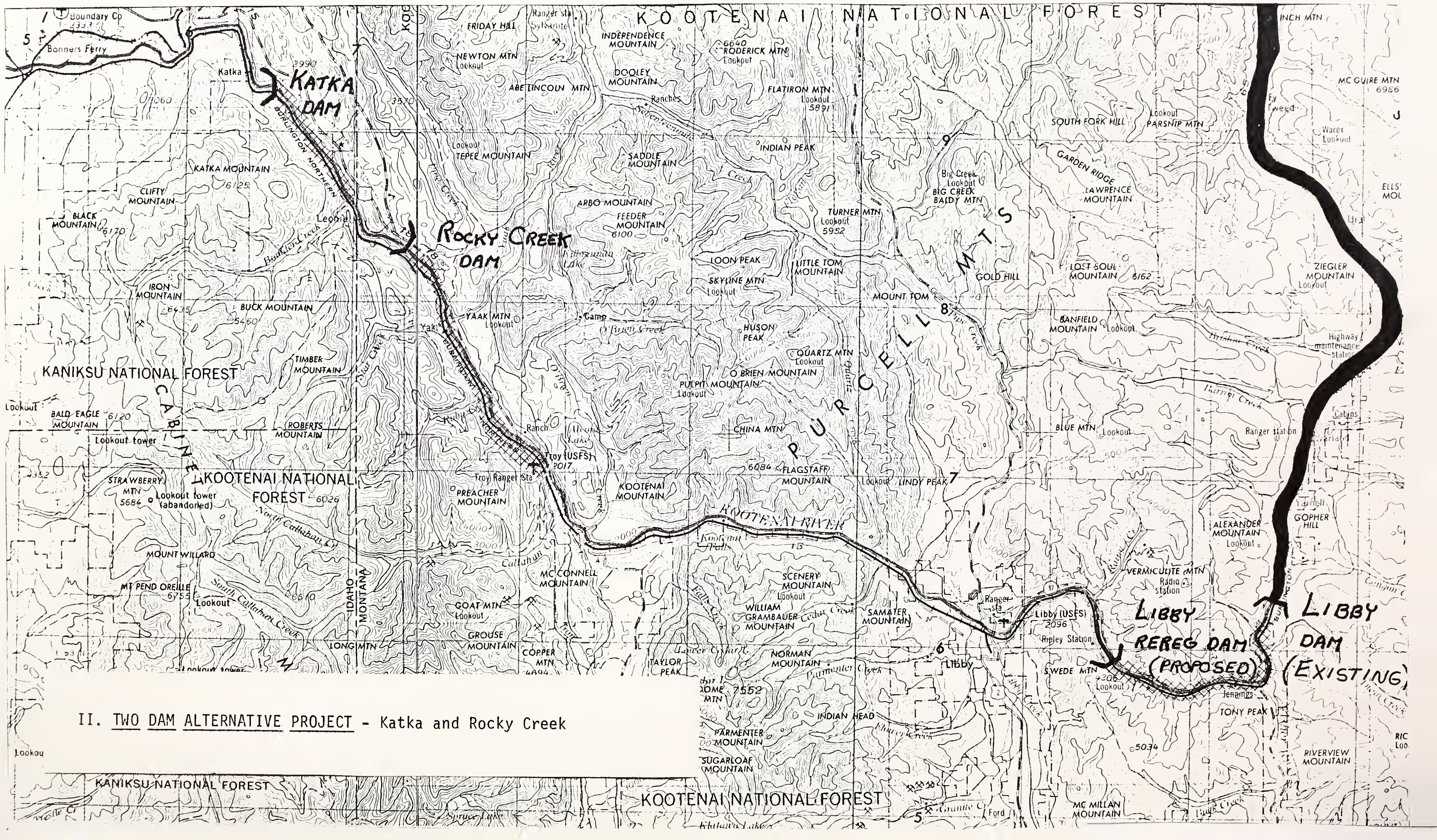
FIGURE 1. Kootenai River Alternative Dam Sites.



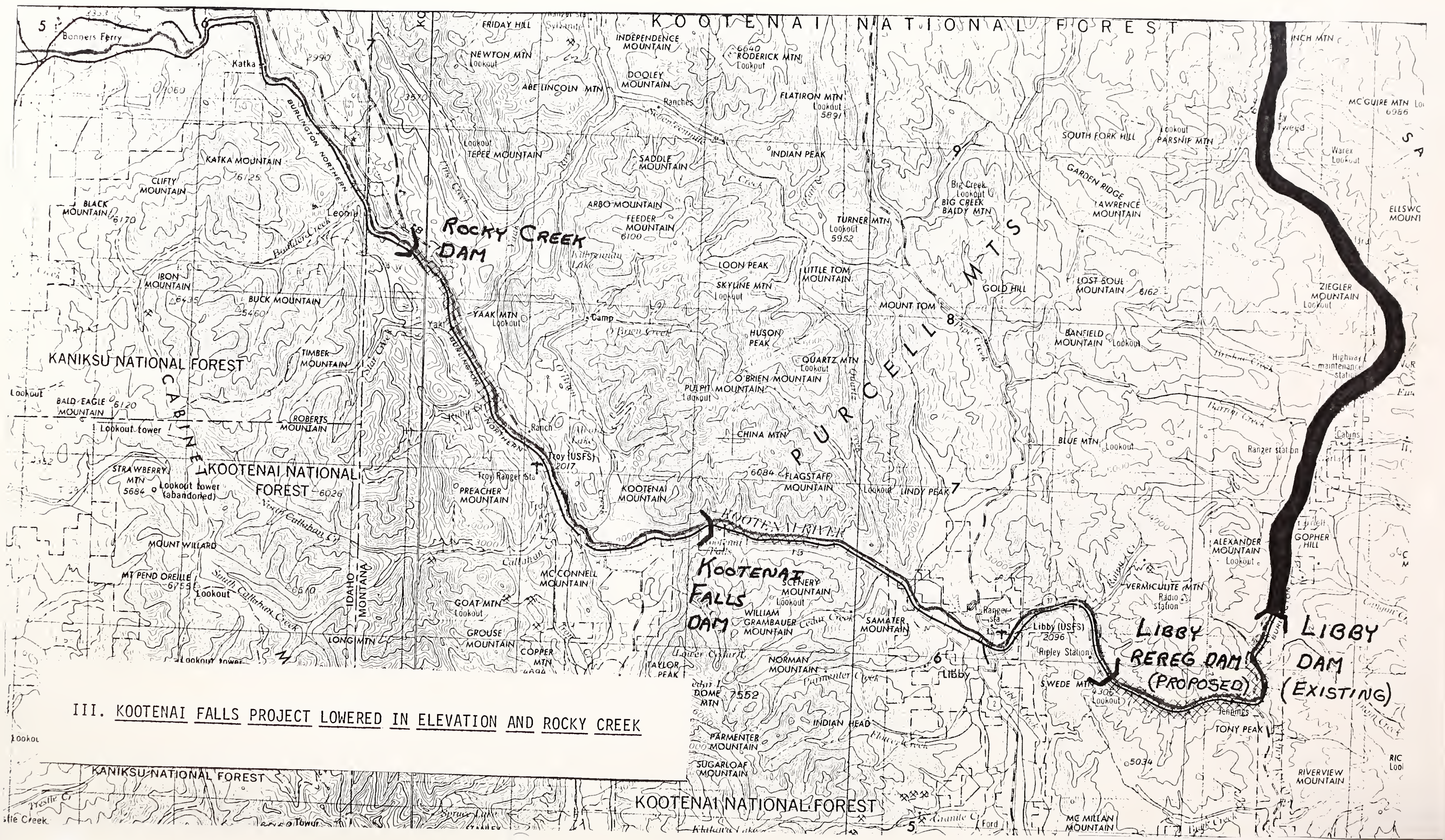
* PREFERRED ALTERNATIVE - Kootenai Falls



I. SINGLE DAM ALTERNATIVE PROJECT - Katka



II. TWO DAM ALTERNATIVE PROJECT - Katka and Rocky Creek



III. KOOTENAI FALLS PROJECT LOWERED IN ELEVATION AND ROCKY CREEK

in this report. The variation in dam height suggested as alternatives for the Rocky Creek and O'Brien Creek sites have little influence on acreages of vegetation that would be inundated. Therefore, the affected acreage of various vegetation types would be essentially the same for a dam at any of the suggested heights at either the Rocky Creek or O'Brien Creek sites.

VEGETATION

The following information is excerpted from a report prepared by Olson & Elliott (1979) for DNRC. It provides a general overview of vegetation types and importance of riparian habitat in northwestern Montana.

The vegetation of northwestern Montana is floristically different from that in other parts of the state, largely because of the climate. Moisture-laden air from the Pacific Ocean enters northwestern Montana and precipitates 25 or more inches annually in the form of snow and rain. Because of this precipitation, plants whose distribution is centered along the coasts of Washington, Oregon and British Columbia commonly occur as dominant species in the study area. Some such dominant species are: *Thuja plicata* (Western red cedar), *Tsuga heterophylla* (Western hemlock), and *Abies grandis* (grand fir) (Habeck, 1967).

Pfister *et al*. (1974) identified forest habitat types (climax plant communities) for the area. Habitat types found in the area are: *Pseudotsuga menziesii*/*Physocarpus malvaceus* (Douglas fir/ninebark), *Pseudotsuga menziesii*/*Calamagrostis rubescens* (Douglas fir/pinegrass), *Pseudotsuga menziesii*/*Agropyron spicatus* (Douglas fir/bluebunch wheatgrass), and *Thuja plicata*/*Clintonia uniflora* (western red cedar/queencup beadlily).

Riparian plant communities in northwestern Montana typically have been heavily grazed by cattle and altered by agricultural activities. Habeck (1967) reported that Populus trichocarpa (black cottonwood) is a major component of bottomland plant communities in northwestern Montana. Species such as Alnus incana (European white alder), Acer glabrum (dwarf maple), and Betula occidentalis (paper birch) are common associates of Populus trichocarpa (black cottonwood). Species common in adjacent upland plant communities are present in most of the riparian communities. In the Kootenai Falls area, Thuja plicata (Western Red Cedar), Pseudotsuga menziesii (Douglas fir), and Pinus ponderosa (Ponderosa pine) are usually codominants with Populus trichocarpa (black cottonwood) along the Kootenai River.

Foote (1965) analyzed various plant communities of river and streamside vegetation in western Montana. He found that the coniferous trees present in riparian vegetation are usually the same species that occur in the adjacent forest habitat types. Foote said that although a riparian community may be pristine, it is maintained in a continued disclimax state by periodic flooding. Continued erosion and redeposition of surface soil and silt provide optimum growing conditions for seral species that occur in the riparian types. Hawk and Zobel (1974) also considered stands dominated by black cottonwood to be seral stages of forest succession on alluvial landforms.

Methods

Vegetation was mapped at all the NLI alternative sites (NLI 1980) to allow comparison among them.

Photo interpretation was done by ECON, Inc. under contract with DNRC (ECON 1981), with an Old Delft scanning stereoscope on 1:6,000 scale black-and-white

stereo aerial photography flown on April 25, 1977 by the Montana Department of Highways (see Appendix A), which represent a flow of 14,000 plus or minus 3000 cfs.

Approximately 80 photos were used in the interpretation process. Dimensionally stable transparent polyester overlays were placed on every other aerial photo. Vegetative units and the boundaries of maximum water inundation at each site were delineated.

The inundation and contour information was transferred to the overlays from 7-1/2 minute quad maps with a model 55C Map-O-Graph.

Interpretation was limited to the area below the 2,200-foot contour line or to the edge of the aerial photo. On many of the aerial photos, the 2,200-foot contour line extended off the picture. Since most of the inundated area is well below 2,200 feet, this loss of photo coverage is of little significance.

All areas within the inundation lines were planimetered and the acreage of each type of land surface (delineation units) was tabulated. In two instances the inundation lines extended off the aerial photography. On Photo 24 of the series, the inundation line extends off the photo, leaving the surface of approximately 50 acres unknown. Photo 18 of the series excludes approximately 20 acres. The loss of these data is of little significance, because both of these sites are heavily forested upslope, and can be assumed to be coniferous types.

Use of these data in comparing sites is subject to the following limitations and/or qualifications:

There are inaccuracies due to several steps involving the transfer of inundation lines to the 7-1/2 minute quad maps and then to the aerial photographs. Based on national map accuracy standards, 1/30 of an inch at map scale is the allowable line deviation limit. This would allow for a deviation of plus or minus 67 feet at the 7-1/2 minute quad scale.

There were several sources of interpretation inconsistency. Among these were the difficulty in using the several extremely "crabbed" stereo photo pairs; the photography of the area in April before green-up of deciduous species; and the use of black-and-white photography rather than color or color infrared, either of which would produce more useful data.

Although the compensating polar planimeter used in this project is an accurate instrument, it should be noted that at the 1:6,000 scale of the aerial photography, the 1/32 of an inch line width of the delineations results in a surface width of approximately 16 feet.

Twelve delineation units were selected with a minimum size of one acre. (At the 1:6,000 photo scale, this is represented by an area about 3/8 inches square). These units correspond to letters on the aerial photos in Appendix A.

A) Rock - Includes all rock outcrops.

B) Grass/Hay - Includes natural grasslands, grass/hay lands, and alfalfa.

C) Deciduous - Includes all deciduous tree species.

D) Shrub - Generally includes shrub growth less than six feet in height.

E-1) Coniferous (High Density) - Includes all coniferous species with a canopy coverage representing 50 percent or more of the total surface area in relation to visible understory.

E-2) Coniferous (Low Density) - Includes all coniferous species with the canopy coverage representing less than 50 percent of the total surface area in relation to visible understory.

F) Other - Includes clearcuts, landslides, and burn areas.

G) Urban - Includes residential and commercial areas.

H) Wetland - Includes potholes, marshes, lakes, and streams.

I) Developed - Includes gravel pits, railroads, and roads (generally major arterials).

J) River - The Kootenai River.

K) Gravel Bars - Includes those formed by the Kootenai River and by feeder streams to the Kootenai River.

Results & Discussion

Table 1 lists acreages of units within the inundation zones of each of the alternative sites. Units used are described under "Methods."

Table 1. Acreages of Vegetation Units Below Inundation Levels at Alternative Sites.

	Rock	Grass/Hay	Deciduous	Shrub	High density/ Low density Coniferous	Other	Urban	Wetland	Developed	River	Gravel Bar	TOTAL
Katka Low 1817'	.3	9.8	22.3	0.5	100.6/7.1	1.6		0.5	36.0	333.3	83.6	595.60
Katka High 1862'	3.7	118.5	141.6	17.2	709.5/96.5	10.2	8.8	17.4	156.3	1039.1	286.3	2605.1
Rocky Creek 1842-3' el.	1.1	7.3	2.5	5.8	105.3/17.7	3.1		10.0	23.6	308.0	97.5	581.9
Ruby Creek 1868'		68.4	6.9	1.9	172.7/10.8	0.6	17.9		39.8	206.1	67.8	592.9
O'Brien Creek 1897'	15.6	61.1	19.4	8.7	101.7/2.1		0.7	3.3	5.8	249.5	78.9	546.9

Source: ECON, Inc. 1981.

Note: Sites listed are those included in NLI application (1980)

New sites inundations (HARZA 1980) would be of similar magnitude (see Methods).

Even with the problems cited in the Methods Section, the acreage tabulations provide an essentially good basis for making relative comparisons of each site. Comparison of sites are discussed in terms of wildlife habitat in the Wildlife Section.

Generally, in all the alternate sites, delineation type K (Gravel Bar) was completely within the inundation line. Delineation types E-1 and E-2 (coniferous types) usually represented the next largest inundation area. No other delineated type appeared to represent a significant proportion of the total inundated area.

WILDLIFE

Wildlife usage of each NLI alternative site was assessed for comparison purposes.

Methods

A DNRC biologist took a field trip to the study in October 1980. Reconnaissance of the sites revealed that, because of topography, inaccessibility and limited time, most information would have to be obtained by literature review, interviews with knowledgable resource specialists in the area, and by interpretation of vegetation data (see Vegetation Section). The only wildlife species examined in the literature review were those which could help determine the relative impact risk of the alternative sites.

The following list of concerns was used for reconnaissance level evaluation of each site.

Big Game Ranges

Amount of white-tailed deer and elk winter range
(or U.S. Forest Service "potential" winter range)

Extent of bighorn sheep use areas

Endangered or Threatened Species

bald eagle

Grizzly bear

Other Species of Concern

Osprey

Waterfowl

General information on wildlife species distribution in the vicinity of the alternative dam sites is available from the Montana Department of Fish, Wildlife and Parks (Brown 1981), from the Kootenai National Forest Supervisor's Office in Libby, and from studies done in the area (DNRC 1979; Joslin 1978, Craighead and Craighead 1979; and Meyer 1979). This information was used to develop a general description of the existing wildlife in the area.

Results and Discussion

Riparian habitat is relatively less abundant than coniferous forests in the Kootenai drainage. The limited deciduous riparian habitats are of great

importance to wildlife. The alternative sites are for the most part located in narrow valleys with a small band of streamside riparian vegetation. Coniferous forests, although less important to wildlife, cover a much larger area upslope from the river. Some of the study areas have very little riparian vegetation as reflected in the much higher proportion of coniferous forests within the inundation zones.

The alternative sites are ranked according to type and amount of wildlife habitat within the pool area of each. The criterion for ranking was the acreage of deciduous trees and shrubs within the pool area (see Table 1). This criterion was chosen because this habitat type was found to be most important to several wildlife species in the area of the proposed Libby Reregulating Dam (DeSimone 1980). The ecological importance of riparian vegetation for wildlife and for stabilization of the soil has been well documented. Stevens et al. (1977) reported that use of riparian habitats by migrating passerine birds was substantially higher than that of adjacent nonriparian habitats. Hehnke and Stone (1978) studied the value of riparian habitats for songbirds. Avian diversity and density of natural riparian vegetation was compared with that of riparian vegetation on riprapped berms. Avian diversity was 71 percent less and density was 93 percent less on riprapped areas. Migratory peaks of bird diversity and density were higher in the natural riparian vegetation than in vegetation on the riprapped area. The suggested reason for these differences was that vegetation diversity is higher in natural areas. Natural riparian vegetation is layered and structurally diverse.

Anderson et al. (1978) researched the relationships between revegetated riparian floodplains and wildlife populations. They found that horizontal and vertical foliage diversity and presence of cottonwoods and willows were positively correlated with the number of bird species present. Wildlife

monitoring of the area showed that the growth of annual plant species is important for attracting large wintering populations of birds the first year after planting.

Joslin (1978) conducted a wildlife inventory of the Kootenai Falls area and found that of the 211 bird species known to occur in the Kootenai Basin, over 50 depend directly upon water, and a majority depend upon riparian habitat. Joslin found that five of the six ungulate species in the Kootenai Falls area use the riparian vegetation to some extent. Bighorn sheep make extensive use of riparian grasslands, especially in spring. Joslin emphasized the value of riparian habitat (1) for bank stabilization, (2) a buffer between aquatic ecosystems and potential impacts of upland activities on water quality, (3) as green belts, (4) in maintenance of instream flows by contributing riparian zone groundwater, and (5) for wildlife habitat.

Erman et al. (1977) studied riparian vegetation of 62 streams in northern California to determine how buffer strips of riparian vegetation influenced the impact of logging on water quality and benthic invertebrates. They found that buffer strips of streamside vegetation mitigated the impacts of adjacent logging on water quality and benthic invertebrate populations. This study is applicable to the alternate dam sites because the proposed Reregulating Dam area has climate, topography, and available wildlife habitat similar to that of the alternative sites. DeSimone's study showed deciduous bottomland most important for small mammals, birds, and ungulates while mixed coniferous-deciduous bottomland was less important.

Site Comparisons

The High Katka site contains more riparian habitat than any of the other projects. The O'Brien Creek alternative contains the second most riparian habitat, Low Katka third, Ruby Creek fourth, and Rocky Creek fifth. This is a preliminary reconnaisance-level ranking of the sites. The possibility that unique features and habitats may be present cannot be ruled out, but more detailed study of the sites would be required to determine this.

According to the USDA, large numbers of deer and elk cross the river in winter just upstream from the island at the Katka site (Appendix B) to gain access to the low areas of southern exposure on the north shoreline. The area south and west of the river at the Katka site (Appendix B) provides winter range for the Katka Ridge elk herd. This area constitutes the most important elk area in Boundary County, Idaho (Rogers 1980), even though elk numbers are relatively low (30-50 animals). The extent of waterfowl use of islands below the Katka dam site is unknown, but there is thought to be some use (Summerfield 1980).

Portions of the Rocky Creek area are very well suited for the production of big game winter forage, according to the USFS (USDA 1976). According to a Fish, Wildlife, and Parks biologist (Brown 1981), use of the area by white-tailed deer is fairly high during winter. There is one osprey nest within the study area, but there was no evidence of recent activity (Appendix Map WL).

The Ruby Creek study area contains lands suitable for winter game forage and cover production (USDA 1979) and currently supports a number of wintering white-tails (Brown 1981). There is one osprey nest with no evidence of recent activity within the study area (Garcia 1980) (Appendix B).

The O'Brien Creek area, like Ruby Creek, contains land suitable for winter game forage and cover production (USDA 1976). Two osprey nests were reported within the O'Brien Creek study area, but U.S. Forest Service personnel who searched for them could not find them (Appendix B).

Meyer (1979) used an airplane to study bald eagle use of the Kootenai River. Eighteen bald eagle observations were made between the Katka site and the Yaak River mouth. Of these, 16 were in the Katka study area, and two in the Rocky Creek study area. No night roosts were identified downstream from the Yaak River mouth. There were 28 aerial observations between the mouth of the Yaak River and Kootenai Falls. Fourteen of these (50 percent) were between the Yaak River and Troy. Based on all these observations, Meyer estimated a winter population of 17 bald eagles between Bonner's Ferry, Idaho and Libby, Montana. Ten of these wintered between Bonner's Ferry and the Yaak River with the remainder wintering between the Yaak River and Libby. Three night roost sites were identified south of the Kootenai Falls preferred site. Meyer's study showed eagles most commonly used cottonwood trees and Douglas fir for perching, usually within 50 feet of the river (Meyer 1979).

Table 2 was derived from the wildlife use map (Appendix B). This table shows that the high Katka alternative contains the most wildlife habitat of the types this report is concerned with. All sites contain a large amount of white-tailed deer winter range but elk winter range is concentrated at the Katka site. The Ruby and O'Brien creek alternatives contain white-tailed deer winter range and bald eagle perch sites.

TABLE 2
Wildlife habitat use
site comparison- alternative sites

Dam Project	Bald Eagle Aerial(1) Observations	Bald Eagle Perch Sites(2)	White-tailed Deer Winter Range(3)	Elk Winter Range(4)	Known Active Osprey Nests
Katka High	15	N.D.	High	High	4
Katka Low	13	N.D.	High	High	3
Rocky Cr.	2	8	High	Low	1
Ruby Cr.	N.D.	6	Medium	Low	0
O'Brien Cr.	N.D.	7	High	Low	0

(1) Information available between Katka and Yaak River only
(2) Information available between Yaak River and Kootenai Falls only
(3) Rated High or Medium depending upon amount of area used
(4) Rated High or Low depending upon presence or absence of winter range
N.D. = No Data

PART II. KOOTENAI FALLS BIGHORN SHEEP STUDY

Three meadows upstream from Kootenai Falls (Figure 2) were studied in detail to determine how much they were used as bighorn sheep winter range. Previous work (DNRC 1979) has contributed to knowledge of sheep distribution throughout the sheep range. Further study is needed to determine how much these sheep use the meadows at other times of the year.

Methods

The meadows near Kootenai Falls were studied for 20 days during January and February 1981 to determine whether they were used by sheep. Ground observations were made at various times of day, and aerial observations were made during the afternoon.

Most of the observation was done during the morning and evening. Observation was done at midday on days when morning or evening hours were taken up by travel to or from the area, or by preparation for observation flights. Morning observations were defined as those occurring between 0730-1100 hours;

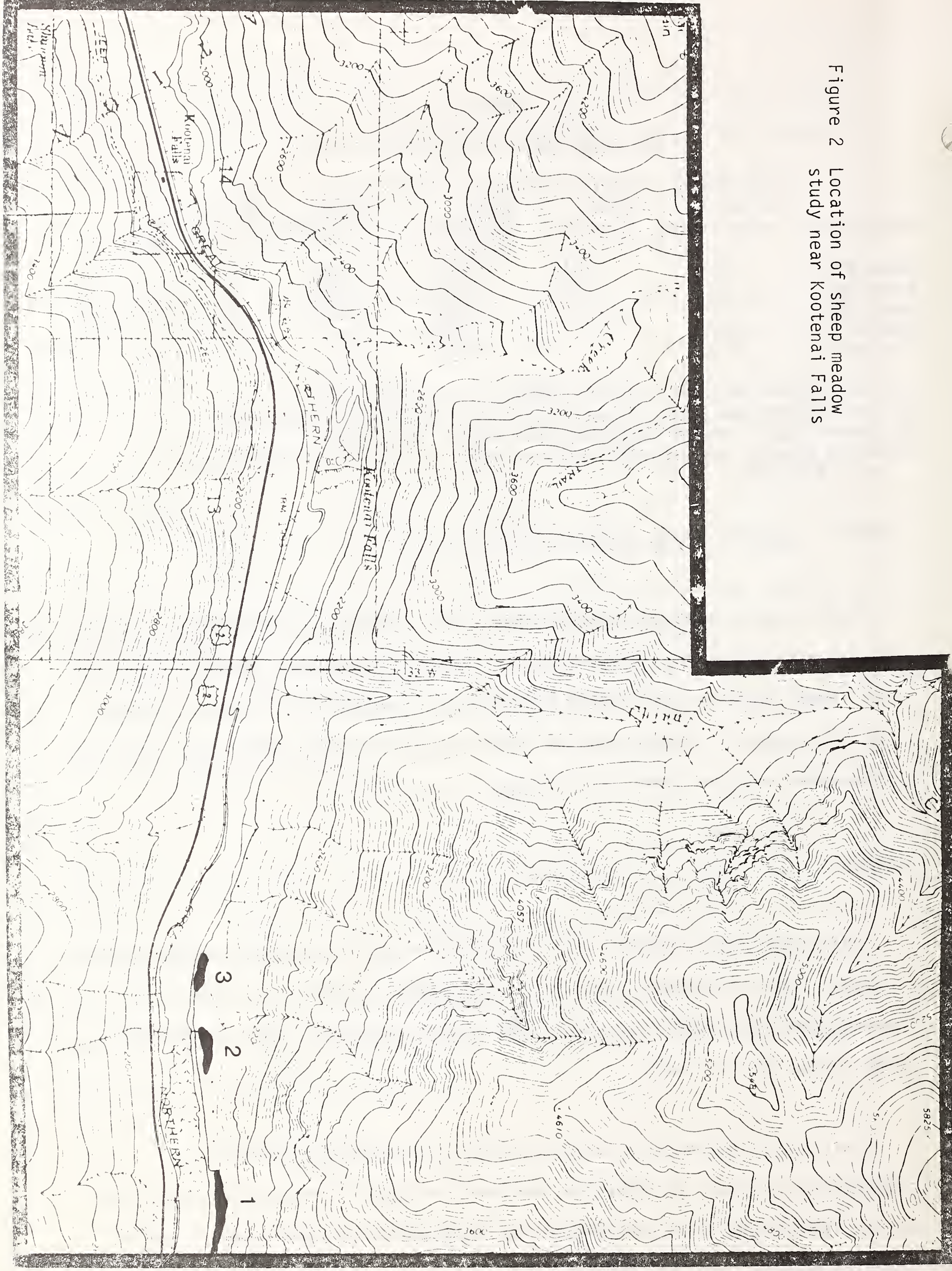


Figure 2 Location of sheep meadow study near Kootenai Falls

midday observations 1100-1500 hours; and evening observations, 1500-1830 hours. The intent was to make four flights per month, but weather conditions allowed only one per month.

For the ground observations, the observer was stationed on the shore opposite each meadow for approximately one hour per visit, viewing the meadow and surrounding terrain for bighorn sheep. When sheep were observed, a 20-power spotting scope was used to ascertain age, sex, number, and activity of the sheep. The duration of observation times varied, but the observer usually kept the sheep in view until they disappeared into the timber, darkness fell, or there was only enough time to check the other meadows before dark. Data and locations are recorded on data sheets and maps available at DNRC. Other incidental observations were recorded on data sheets or in extensive field notes kept by the observer. Each visit to a meadow was recorded whether animals were observed or not.

On January 18th and February 7th, aerial observation was performed by the observer and the pilot, Robert Groom of Libby. The pilot flew over the study area in a series of low elevation passes. The first pass covered the lower portion of the area and each subsequent pass would be at a slightly higher elevation but at the same distance above ground level so that the entire area was flown over at a uniform height. The information collected on the aerial observations was of the same type collected during the ground observations.

Table 3 shows the monitoring schedules. In January trips were made to the meadows. Fifty-six trips were completed in February.

TABLE 3
SCHEDULE OF FIELD WORK, KOOTENAI FALLS BIGHORN SHEEP STUDY

Date	Meadow No.1	Meadow No.2	Meadow No.3
1/9	MS,E	M,E	M,E
1/10	MD	MD	MD
1/18	MA	MA	MA
1/19	MS,E	M,E	M,E
1/20	MD	MD	MD
1/26	E	E	E
1/27	M,E	M,E	M,E
1/28	M,E	M,E	M,E
1/29	M,ES	M	M
1/30	MS	M	M
2/4	M,E	M,E	M,E
2/5	M,E	M,E	M,E
2/6	M,E	M,E	M,E
2/7	MA,E	MA,E	MA,E
2/8	MD,E	MD,ES	E
2/9	M,E	M,E	M,E
2/10	E	E	E
2/20	E	E	E
2/21	M,E	M,E	M,E
2/22	MD,E	MD,E	MD,E
2/23	M	M	M

Key:
M = morning observation (0730-1100)
MA = midday aerial observation (1200-1400)
E = evening observation (1500-1830)
MD = midday observation (110-1500)
S = indicates sheep observed

Results & Discussion

Table 4 summarizes the ground observations; the number of groups of bighorn sheep observed; and the total number of sheep observed. Table 5 provides the same type information for the two aerial trips. During 17 days of monitoring, bighorns were observed on 16 occasions, for a total of 65 sightings on seven different days. Table 6 lists the environmental parameters recorded for each group of sheep observed. It contains information from both ground and aerial observations. Figure 3 shows locations and times of bighorn sheep observations. Three of the 16 groups (19 percent) were observed on a sparsely timbered flat in

TABLE 4. Numbers of Bighorn Sheep Seen During Ground Observations of the Kootenai Falls Study Area, January and February, 1981.

Date	Time of Day	No. of Trips	No. of Groups	Total	Male	Female	Lambs	Sex/Age Unknown
January	Morning	21	3	15	4	6	3	2
	Midday	6	0	N	N	N	N	N
	Evening	16	1	8	2	5	1	0
TOTAL		43	4	23	6	11	4	2
February	Morning	15	0	N	N	N	N	N
	Midday	2	0	N	N	N	N	N
	Evening	21	2	9	1	5	2	1
TOTAL		38	2	9	1	5	2	1

N = no observations attempted.

TABLE 5. Number of Bighorn Sheep Seen During Aerial Observations of the Kootenai Study Area, January 18 and February 7, 1981.

Date	No. of Groups	Number of Sheep TOTAL	Male	Female	Lambs	Sex/Age Unknown
January 18	7	30	5	0	0	25
February 7	3	3	2	1	0	0
TOTAL	10	33	7	1	0	25

TABLE 6. Environmental Parameters of Bighorn Sheep Observations, January and February, 1981.

Date	No. of Sheep	Activity	Slope	Aspect	Vegetation	Topography	Elevation
1/9 G[1]	6	FE	25	S	PD	BROK	2600
1/18 A[2]	3	BF	UNK	SW	RO	BROK	3200
	7	BF	UNK	SW	RO	BLUF	3000
	5	BE	UNK	SW	UNK	PARK	3400
	3	BF	UNK	SW	UNK	TIMB	3000
	4	BF	UNK	SE	RO	BROK	3100
	7	BF	UNK	S	UNK	PARK	2900
	1	FE	UNK	S	RO	BROK	3100
1/19 G	3	BF	<5	S	CC	FLPL	2000
1/29 G	8	FE	<5	S	CC	FLPL	2000
1/30 G	5	BF	<5	S	CC	FLPL	2000
1/30 G	1	ST	25	S	RO	BROK	2200
2/7 A	1	FE	25	S	ST	TALU	2600
	1	BE	10	SE	PD	TIMB	2300
	1	BE	15	SW	PD	TIMB	4000
2/8 G	6	BF	25	S	PD	TALU	2500
2/8 G	3	BF	25	S	RO	BROK	2500
TOTAL	65						

[1]G = Ground Observations
[2]A = Aerial Observations

NOTE: Abbreviations as in Montana Department of Natural Resources and Conservation (MDNRC) (1979).

Activity	Vegetation	Topography
BE = Bedded	CC = Cottonwood-Conifers	BROK = Broken
BF = Bedded & Feeding	PD = Ponderosa Pine & Douglas Fir	BLUF = Bluff
FE = Feeding	RO = Rocky Outcrops	FLPL = Floodplain
ST = Standing	ST = Scree & Talus	PARK = Park
		TALU = Talus
		TIMB = Timbered

UNK = unknown

FIGURE 3. Location of Bighorn Sheep During Surveys, Jan. - Feb. 1981.

□ Morning ground observations.

O Afternoon aerial observations.

△ Evening ground observations.

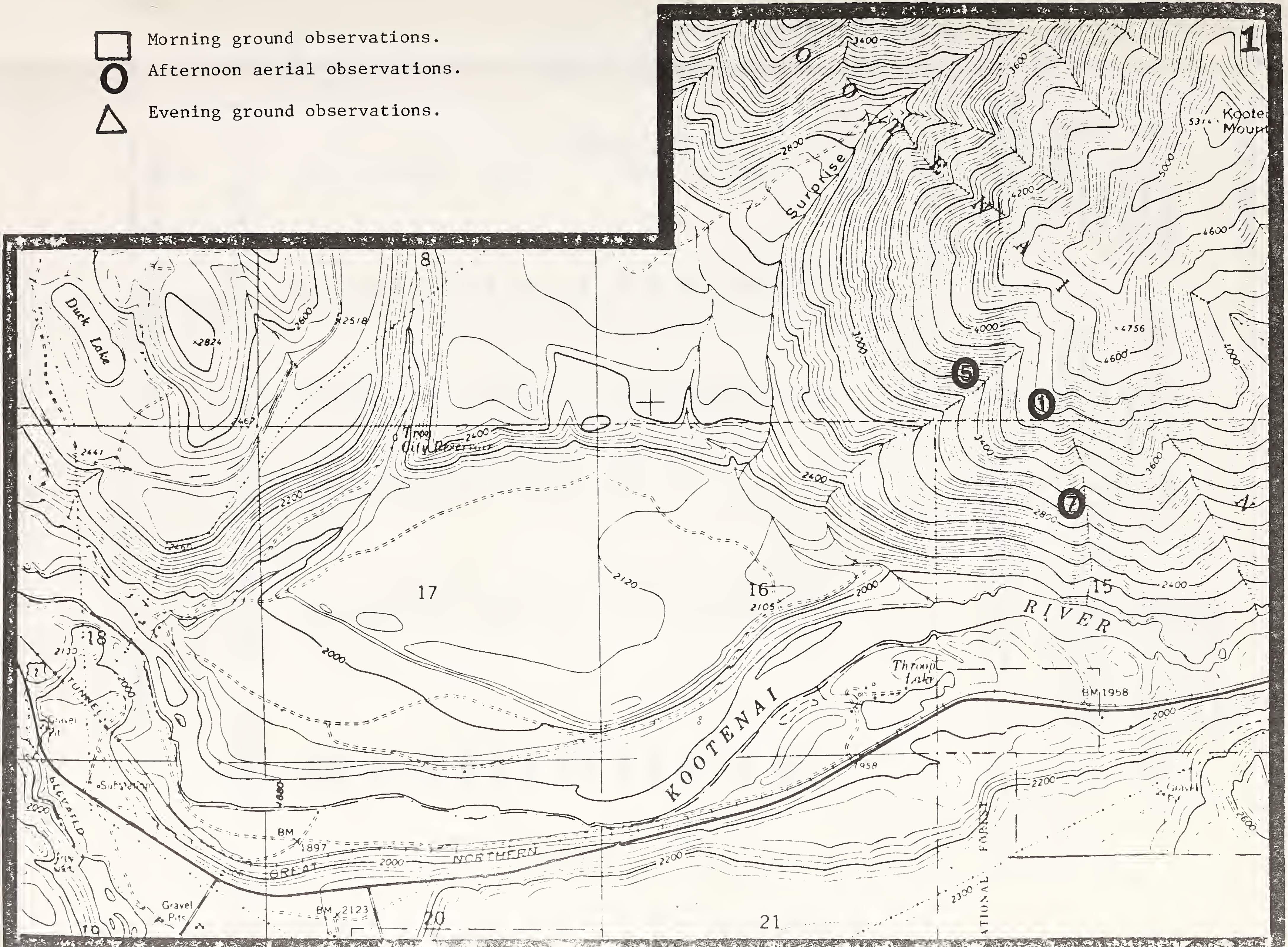
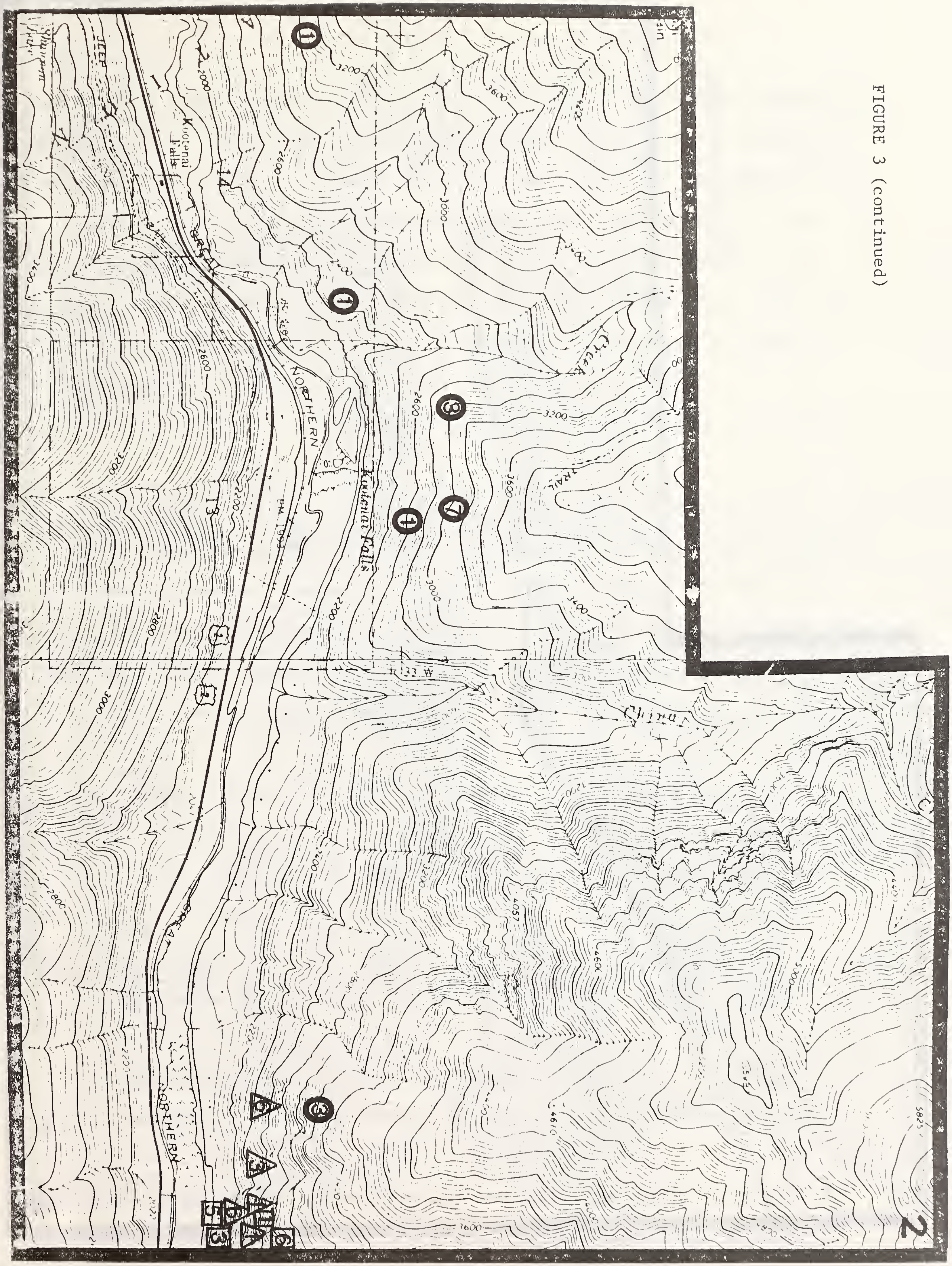


FIGURE 3 (continued)



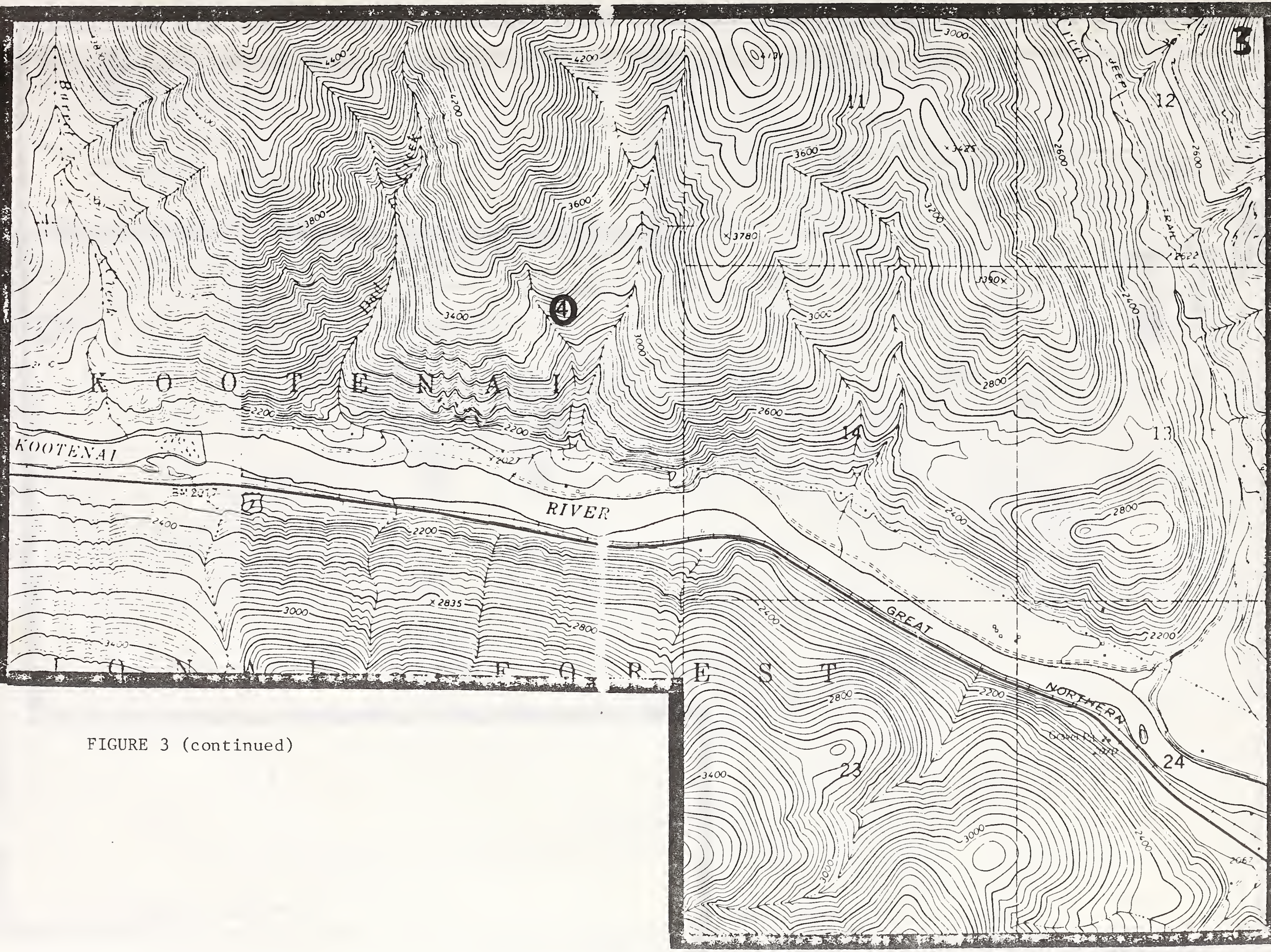


FIGURE 3 (continued)

the Kootenai River floodplain. This flat is adjacent to the eastern boundary of meadow no. one. Five groups (31 percent) were seen in broken terrain habitats from 2500 feet to 3200 feet elevations. One group (6 percent) was observed on a bluff at 3000 feet elevation. Two groups (13 percent) were observed in open parks at 2900 feet and 3600 feet elevations. Three groups (18 percent) were seen in timbered habitats between 2300 feet and 3000 feet elevations. Two groups in February were observed in talus areas at 2500 feet and 2600 feet elevations.

Bighorn sheep were never observed in the meadows. On three occasions, groups of sheep were within 100 yards of the eastern boundary of meadow no. one, but never in the meadow proper. A salt block had been placed just east of meadow no. one and probably accounted for the observations there, according to local biologists. However, the sheep were seen feeding extensively throughout the sparsely timbered flat adjacent to the meadows.

Although no evening use has been documented, early morning and late afternoon sightings can contribute to knowledge of location of sheep during the evening. Bedding areas in the apple orchard of Meadow No. 3 may be used by white-tailed deer rather than sheep. During this study sheep were never observed near Meadow No. 3 but were observed bedded down near Meadow No. 1, while white-tailed deer were observed several times in and near Meadow No. 3.

Although no evening observations were made, the behavior of the sheep observed was such that the probability of night use of the meadows is small.

Snow depths normally are much greater than they were this year in this region. The meadows usually are more deeply buried by snow than the south-

facing slopes that rise abruptly north of them. In a typical year, the meadows are the first areas to green up and may be nutritionally important to the sheep. Al Christensen, wildlife biologist for the Kootenai National Forest, told the observer these meadows were of great importance to the sheep in late May and early June, after lambing.

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APPENDIX A

AERIAL PHOTOGRAPHY OF STUDY AREA

(originals on file with DNRC, Helena, Mt)

(Continuous series from Katka upstream to end of O'Brien pool)

INUNDATION AND CONTOUR LINE LEGEND

KATKA (LOW DAM)

KATKA (HIGH DAM)

ROCKY CR. TUNNEL #8 DAM

RUBY CR. DAM

O'BRIEN DAM

2200 FT. CONTOUR

APPENDIX B.

Wildlife Overlay of NLI Kootenai River Project Alternative Sites

(Original on file at DNRC Office, Helena, Mt.)